WHAT IS CLAIMED IS:

1. A method for reconstructing an image of an object of a computed tomographic imaging system having a detector array and a radiation source, wherein an arc of the detector array is not concentric to a focal spot of the radiation source, said method comprising:

scanning the object with the computed tomographic imaging system to obtain a projection dataset;

performing a geometric correction of the projection dataset according to a corrected fan angle; and

reconstructing an image utilizing the corrected projection dataset.

2. A method in accordance with Claim 1 wherein said performing a geometric correction comprises interpolating the projection dataset into a uniformly spaced projection dataset.

3. A method in accordance with Claim 1 wherein said performing a geometric correction comprises rebinning the projection dataset into a set of parallel datasets.

4. A method in accordance with Claim 3 wherein rebinning the projection dataset into a set of parallel datasets comprises interpolating a sinogram along a line defined by a relationship written as:

$$\beta = \beta_0 - \gamma',$$

where:

$$\gamma' = \tan^{-1}\left[\frac{R\sin\gamma}{R\cos\gamma + \Delta_s + \Delta_d}\right]$$

and β_0 is an angle of an isoray of a radiation beam from the radiation source, γ is a detector fan angle, β is a projection angle, R is a radiation source to detector element distance in an original geometry in which an arc of the detector array is concentric to a focal spot of the radiation source, and Δ_s and Δ_d are distances that the radiation source and the detector element are from their respective positions in the original geometry, respectively.

5. A method in accordance with Claim 3 further comprising resampling the parallel datasets so that the datasets are uniformly spaced.

6. A method in accordance with Claim 5 wherein resampling the parallel datasets so that the datasets are uniformly spaced further comprises determining a distance of radiation rays to an isocenter.

7. A method in accordance with Claim 6 wherein said distance of radiation rays to an isocenter is determined in accordance with a relationship written as:

$$t = (r + \Delta_s)\sin\gamma'$$

where t is the distance of a ray to the isocenter, r is the distance of the radiation source to the isocenter distance in an original geometry in which an arc of the detector array is concentric to a focal spot of the radiation source.

8. A method in accordance with Claim 7 further comprising determining a detector array index s utilizing said distance t in accordance with a relationship written as:

$$s = \frac{1}{\Delta\gamma}\left\{\sin^{-1}\left[\frac{t}{r + \Delta_s}\right] + \sin^{-1}\left[\frac{(\Delta_s + \Delta_d)t}{R(r + \Delta_s)}\right]\right\}$$

where $\Delta\gamma$ is a fan angle between adjacent detector elements in the original geometry.

9. A method for reconstructing an image of an object of a computed tomographic imaging system having a detector array and a radiation source, wherein an arc of the detector array is not concentric to a focal spot of the radiation source, said method comprising:

scanning the object with the computed tomographic imaging system to obtain a projection dataset;

rebinning the projection dataset into a set of parallel datasets including interpolating a sinogram along a line defined by a relationship written as:

$$\beta = \beta_0 - \gamma',$$

where:

$$\gamma' = \tan^{-1}\left[\frac{R\sin\gamma}{R\cos\gamma + \Delta_s + \Delta_d}\right]$$

and β_0 is an angle of an isoray of a radiation beam from the radiation source, γ is a detector fan angle, β is a projection angle, R is a radiation source to detector element distance in an original geometry in which an arc of the detector array is concentric to a focal spot of the radiation source, and Δ_s and Δ_d are distances that the radiation source and the detector element are from their respective positions in the original geometry, respectively;

resampling the parallel datasets so that the datasets are uniformly spaced; and

reconstructing an image utilizing the set of resampled parallel datasets.

10. A method in accordance with Claim 9 wherein resampling the parallel datasets so that the datasets are uniformly spaced further comprises determining a distance of radiation rays to an isocenter.

11. A method in accordance with Claim 10 wherein said distance of radiation rays to an isocenter is determined in accordance with a relationship written as:

$$t = (r + \Delta_s)\sin\gamma'$$

where t is the distance of a ray to the isocenter, r is the distance of the radiation source to the isocenter distance in an original geometry in which an arc of the detector array is concentric to a focal spot of the radiation source.

12. A method in accordance with Claim 11 further comprising determining a detector array index s utilizing said distance t in accordance with a relationship written as:

$$s = \frac{1}{\Delta\gamma}\left\{\sin^{-1}\left[\frac{t}{r + \Delta_s}\right] + \sin^{-1}\left[\frac{(\Delta_s + \Delta_d)t}{R(r + \Delta_s)}\right]\right\}$$

where $\Delta\gamma$ is a fan angle between adjacent detector elements in the original geometry.

13. A method for reconstructing an image of an object of a computed tomographic imaging system having a detector array and a radiation source, wherein an arc of the detector array is not concentric to a focal spot of the radiation source, said method comprising:

scanning the object using step-and-shoot scanning with the computed tomographic imaging system, without applying a weighting function, to obtain a projection dataset;

rebinning the projection dataset into a set of parallel datasets; and

reconstructing an image utilizing the set of parallel datasets.

14. A method for reconstructing an image of an object of a computed tomographic imaging system having a detector array and a radiation source, wherein

an arc of the detector array is not concentric to a focal spot of the radiation source, said method comprising:

scanning the object with the computed tomographic imaging system using helical or halfscan acquisition to obtain a projection dataset;

weighting the projection dataset in accordance with a weighting function w', derived from a weighting function w for an original geometry in which the arc of the detector array is concentric to the focal spot of the radiation source, wherein

$$w' = w(\gamma', \beta, n)$$

and

$$\gamma' = \tan^{-1}\left[\frac{R\sin\gamma}{R\cos\gamma + \Delta_s + \Delta_d}\right]$$

wherein γ is a detector fan angle, β is a projection angle, R is a radiation source to detector element distance in the original geometry, and Δ_s and Δ_d are distances that the radiation source and the detector element are from their respective positions in the original geometry, respectively;

rebinning the projection dataset into a set of parallel datasets; and

reconstructing an image utilizing the set of parallel datasets.

15. A computed tomography imaging system having a detector array and an radiation source, wherein an arc of the detector array is not concentric to a focal spot of the radiation source, said imaging system configured to:

scan an object to obtain a projection dataset;

perform a geometric correction of the projection dataset according to a corrected fan angle; and

reconstruct an image utilizing the corrected projection dataset.

16. A system in accordance with Claim 15 wherein to perform a geometric correction, said system is configured to interpolate the projection dataset into a uniformly spaced projection dataset.

17. A system in accordance with Claim 15 wherein to perform a geometric correction, said system is configured to rebin the projection dataset into a set of parallel datasets.

18. A system in accordance with Claim 17 wherein to rebin the projection dataset into a set of parallel datasets, said system is configured to interpolate a sinogram along a line defined by a relationship written as:

$$\beta = \beta_0 - \gamma',$$

where:

$$\gamma' = \tan^{-1}\left[\frac{R\sin\gamma}{R\cos\gamma + \Delta_s + \Delta_d}\right]$$

and β_0 is an angle of an isoray of a radiation beam from the radiation source, γ is a detector fan angle, β is a projection angle, R is a radiation source to detector element distance in an original geometry in which an arc of the detector array is concentric to a focal spot of the radiation source, and Δ_s and Δ_d are distances that the radiation source and the detector element are from their respective positions in the original geometry, respectively.

19. A system in accordance with Claim 17 further configured to resample the parallel datasets so that the datasets are uniformly spaced.

20. A system in accordance with Claim 19 wherein to resample the parallel datasets so that the datasets are uniformly spaced, said system is further configured to determine a distance of radiation rays to an isocenter.

21. A system in accordance with Claim 20 configured to determine said distance of radiation rays to an isocenter in accordance with a relationship written as:

$$t = (r + \Delta_s)\sin\gamma'$$

where t is the distance of a ray to the isocenter, r is the distance of the radiation source to the isocenter distance in an original geometry in which an arc of the detector array is concentric to a focal spot of the radiation source.

22. A system in accordance with Claim 21 further configured to determine a detector array index s utilizing said distance t in accordance with a relationship written as:

$$s = \frac{1}{\Delta\gamma}\left\{\sin^{-1}\left[\frac{t}{r + \Delta_s}\right] + \sin^{-1}\left[\frac{(\Delta_s + \Delta_d)t}{R(r + \Delta_s)}\right]\right\}$$

where $\Delta\gamma$ is a fan angle between adjacent detector elements in the original geometry.

23. A computed tomography imaging system having a detector array and a radiation source, wherein an arc of the detector array is not concentric to a focal spot of the radiation source, said imaging system configured to:

scan the object to obtain a projection dataset;

rebin the projection dataset into a set of parallel datasets including interpolating a sinogram along a line defined by a relationship written as:

$$\beta = \beta_0 - \gamma',$$

where:

$$\gamma' = \tan^{-1}\left[\frac{R\sin\gamma}{R\cos\gamma + \Delta_s + \Delta_d}\right]$$

and β_0 is an angle of an isoray of a radiation beam from the radiation source, γ is a detector fan angle, β is a projection angle, R is a radiation source to detector element distance in an original geometry in which an arc of the detector array is concentric to a focal spot of the radiation source, and Δ_s and Δ_d are distances that the radiation source and the detector element are from their respective positions in the original geometry, respectively;

resample the parallel datasets so that the datasets are uniformly spaced; and

reconstruct an image utilizing the set of resampled parallel datasets.

24. A system in accordance with Claim 23 wherein to resample the parallel datasets so that the datasets are uniformly spaced, said system is further configured to determine a distance of radiation rays to an isocenter.

25. A system in accordance with Claim 24 configured to determine said distance of radiation rays to an isocenter in accordance with a relationship written as:

$$t = (r + \Delta_s)\sin\gamma'$$

where t is the distance of a ray to the isocenter, r is the distance of the radiation source to the isocenter distance in an original geometry in which an arc of the detector array is concentric to a focal spot of the radiation source.

26. A system in accordance with Claim 25 further configured to determine a detector array index s utilizing said distance t in accordance with a relationship written as:

$$s = \frac{1}{\Delta\gamma}\left\{\sin^{-1}\left[\frac{t}{r + \Delta_s}\right] + \sin^{-1}\left[\frac{(\Delta_s + \Delta_d)t}{R(r + \Delta_s)}\right]\right\}$$

where $\Delta\gamma$ is a fan angle between adjacent detector elements in the original geometry.

27. A computed tomography imaging system having a detector array and a radiation source, wherein an arc of the detector array is not concentric to a focal spot of the radiation source, said imaging system configured to:

scan the object using step-and-shoot scanning without applying a weighting function to obtain a projection dataset;

rebin the projection dataset into a set of parallel datasets; and

reconstruct an image utilizing the set of parallel datasets.

28. A computed tomography imaging system having a detector array and a radiation source, wherein an arc of the detector array is not concentric to a focal spot of the radiation source, said imaging system configured to:

scan the object using helical or halfscan acquisition to obtain a projection dataset;

weight the projection dataset in accordance with a weighting function w', derived from a weighting function w for an original geometry in which the arc of the detector array is concentric to the focal spot of the radiation source, wherein

$$w' = w(\gamma', \beta, n)$$

and

$$\gamma' = \tan^{-1}\left[\frac{R\sin\gamma}{R\cos\gamma + \Delta_s + \Delta_d}\right]$$

wherein γ is a detector fan angle, β is a projection angle, R is a radiation source to detector element distance in the original geometry, and Δ_s and Δ_d are distances that the radiation source and the detector element are from their respective positions in the original geometry, respectively;

rebin the projection dataset into a set of parallel datasets; and

reconstruct an image utilizing the set of parallel datasets.